Guidelines for Fermilab CMS RA Supervisors, Mentors, and Guides

By The Fermilab CMS RA Mentoring Committee

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1 Executive Summary

The postdoctoral years are crucial for a young physicist's development into an independent researcher and an excellent, well-rounded scientist. They are often the most creative and productive years in one's career. They are also the years in which the Research Associate (RA) prepares themselves for a challenging search for a permanent position. The success of that search will depend largely on the achievements, skills and reputation developed during the RA years.

The CMS department at Fermilab has a mentoring process to insure that CMS RAs are guided to acquire the skills and to yield achievements expected for a young physicist, and are coached to significantly increase their chances of obtaining a faculty or staff position in HEP. The process will also have the beneficial effect of offering the opportunity and guidance for the Research Associate (RA) to have a rich and fulfilling experience, while effectively contributing to the projects for which Fermilab has taken responsibility.

The basic **mentoring roles** and **mentoring events** within the process are discussed in detail in this document. The process begins with a good start for the RA: a brief research plan is written by the RA with help of the supervisor and mentor, and then extensively reviewed and approved by a mentoring committee reporting to CMS department management. The RAs present their evolving research strategy every 8-12 months to the entire CMS department at monthly postdoc meetings. The RA research strategy and timeline towards a position is discussed in detail during formal annual performance reviews. Supervisors and mentors are also guided, and present the status and research strategy of their RA annually to the mentoring committee. The RA rehearses to give professional presentations for conferences, seminars, and interviews. The RAs are informed about conferences and nominated to give talks. The RAs are also informed about jobs in HEP and encouraged to apply at the appropriate time, and the application package of the candidate is reviewed and refined before submission. The process requires the time and active participation of Fermilab scientists who play the important roles of supervisors, mentors, guides, managers, and members of the RA mentoring committee.

The mentoring program was established in March of 2012 and has been beneficial to the careers of CMS RAs, the functioning and cohesion of the CMS department, and the reputation of Fermilab as a good institution for young physicists. There have been 27 CMS RAs who completed their term positions and 15 received tenure track positions in HEP at universities and laboratories. The process has evolved over time and the content of this document represents our current best practices within the CMS department. It should be also noted, that the RAs hired before the endorsement of this document by the mentoring committee and the CMS group management will be grandfathered so the old rules apply to their existing positions.

2 RA Mentoring Roles.

The RAs work in close collaboration with scientists over a broad spectrum of physics and technical projects. They also collaborate with engineers, computing professionals, or whoever has the knowledge, skills, and experience to introduce RAs to a project, train, and work with them side-by-side on a regular basis. The following play a role in mentoring of the RA:

2.1 Management

CMS management in PPD (CMS group leader and the RA group leader) has ultimate responsibility for the RA. Within PPD there is a CMS department containing a group with all the CMS RAs. The CMS department also contains all Fermilab CMS scientists, including those from other divisions, that supervise, mentor and guide the RA.

2.2 Guides

The RA is expected to select "analysis" and "technical" guides. The role of technical guide and analysis guide is taken on by the Fermilab CMS scientist(s) that work closely with the RA in those areas. One of these guides must serve as the supervisor, and sometimes the other guide will serve as the mentor. More details on the guide roles are provided in Section 3.

2.3 Supervisor

The head of the RA group within the CMS department of PPD is line manager of all the CMS RAs, but delegates day-to-day supervisor responsibilities for each RA to at least one designated CMS scientist. The supervisor's responsibility includes some mentoring and the supervisor must also fill the role of either an analysis guide, or a technical guide, or both. The supervisor has the primary day-to-day responsibility for the RA. The RA's project is often one for which the supervisor has some responsibility, and hence the supervisor often has a vested interest in the research of the RA. However, the supervisor's responsibilities also include "mentoring". The mentoring aspect of the supervision becomes particularly relevant because the RA is a young physicist who is going through his or her formative years as a researcher. Diversity in experience, opportunities to develop leadership and management skills, ability to multitask and communicate effectively in a collaborative environment, crafting of an interesting and independent research program– these are all important aspects of the RA's preparation to take the next step in his or her career development. In mentoring the RAs, supervisors are responsible for assisting in creating a plan that includes their physics and technical activities, as well as for offering advice, guidance and support as the RA faces choices and makes decisions through their postdoctoral years.

2.4 Mentor

Following the official Fermilab procedure, CMS RAs are advised to have a separate mentor who is outside of the line management to supplement the mentoring received from the supervisor. Although the supervisor is still the person responsible for the RA supervision, defined and described above, it is expected that the supervisor and the mentor discuss and agree with each other about their respective roles. They work together on items such as the RA's research plan development and providing guidance on their career development.

2.5 Mentoring Committee

The mentoring committee contains approximately ten CMS scientists: seven working and three ex–officio (CMS department head in PPD, CMS RA group head, and the chairman of the CMS RA Hiring Committee). The mentoring committee has the following tasks:

- Provide guidance to supervisors and mentors.
- Review the research plan of the RA and advise management, supervisor, mentor and RA.
- Receive annual presentations from supervisors and mentors about the past and future research program of the RA. Advise the supervisors and management on the RAs research program. Review requests to extend RA appointment beyond three years and advise management. Review requests to extend RA stays at CERN and advise management.
- Assist the supervisor, mentor, management, and the RA in reviewing and refining the job application package of the RA.

3 Selection of Supervisor, Mentor, and Guides

Once the RA accepts the Fermilab offer, he or she will meet with the head of the RA group in the Fermilab CMS department to receive information about how to select physics and technical projects, identify a supervisor, mentor, and guides. More details about the process are provided below:

3.1 Guides

The RA is expected to select "analysis" and "technical" guides from the body of Fermilab CMS scientists. One of the two guides has to agree to serve as the supervisor, and the other guide may or may not agree to serve as the mentor. If the other guide does not agree to be the mentor, then a third scientist has to be identified to play this role. The maximum recommended number of scientists in the roles of supervising, mentoring and guiding the RA is three (when the mentor is not a guide), and the minimum is two (when the mentor is a guide).

3.1.1 Technical Guide

During the meeting, the RA will receive a short document with a list of hardware, software, and computing projects the CMS department is involved in. Names of the

sub-group leaders and other scientists associated with these projects will also be included in the document. The RAs are required to talk to the sub-group leaders and/or their delegates, discuss with them opportunities in the technical projects, and identify the project of interest. They will also pick the "technical guide" – a CMS scientist who will work closely with the RA on the selected technical project. Sub-group leaders are responsible for identifying high priority areas within their sub-group and helping the RAs to find the right guide.

3.1.2 Analysis Guide

In addition to the list of technical projects, the CMS group management will provide a list with names of potential "analysis guides" along with their physics interests. The RAs are encouraged to talk to as many Fermilab scientists on the list as possible, and, at the very least, ones with whom they share physics interests. When selecting a physics analysis project, the RA can join an existing Fermilab effort or start a new one provided that he/she can convince a Fermilab scientist to join the new effort. This scientist (who will serve as the analysis guide) is expected to be deeply involved in the analysis, including participation in the analysis group meetings, familiarity with the documentation, and being on the analysis note author list. The requirement of having a scientist working closely with the RA on an analysis project comes with many benefits. First, it encourages stronger interaction between Fermilab scientists and RAs, enables scientists to be more involved in CMS physics, and finally ensures that the RA's interests are protected through the guide's participation in analysis group meetings and decisions.

3.2 Supervisor

As described above, the RA will identify one of the guides as the supervisor, who will be closely involved with his or her day to day activities.

3.3 Mentor

CMS department management will also provide a list of potential mentors. Seniority should be considered when selecting a mentor; Associate Scientists should be selected only in exceptional circumstances. CMS department leadership will compose the list of mentors with input from the body of scientists about their availability and interest in mentoring RAs, and will keep it up to date.

The supervisor and mentor will collect the input of the guides and make annual reports to the RA Mentoring Committee (RAMC). If the supervisor, mentor or guides have disagreements that affect the RA in some way, the CMS department management and the RA Mentoring Committee will review the underlying issue and may decide to intervene in order to help resolve it. There are many effective ways to supervise, mentor and guide an RA. The RAMC should not micro-manage the details of the process.

4 Mentoring Events and Guidelines

The following important events are a part of the RA mentoring process:

4.1 Research Plan

One month after hiring, having thoroughly surveyed the opportunities available within the group, the RA selects physics and technical projects, identifies a supervisor, mentor, and guides. He or she then writes a short research plan to be endorsed by the RAMC and approved by the Fermilab CMS department Head. The plan is to be submitted not later than two months after hiring. The RA is expected to develop a plan that is in line with FNAL responsibilities within CMS, and with a well-balanced mix of technical and physics projects.

The plan describes the proposed technical research, physics research, estimated time allocations and timelines for each component, and location (Fermilab or CERN) as a function of time for the first two or more years. The scientists that will be responsible for supervising, mentoring and/or guiding the postdoc should be involved in the preparation of the research plan and review it prior to its submission to the RA mentoring committee. The plan (including names of selected guides, supervisor, and mentor) is reviewed by the mentoring committee and management is advised about possible concerns. In the presence of such concerns the group management and the mentoring committee provide feedback to the RA and the scientists that will be responsible for supervising, mentoring and/or guiding the RA, and initiate an iterative process. At the end of the process the plan is either accepted or modified to address concerns and comments from the mentoring committee and the management. The plan is intended to provide a "good start" on a balanced research strategy for the RA with appropriate supervision, mentoring and guidance from Fermilab scientists.

While and selecting candidate guides, supervisor, and mentor and developing the plan, the RA keeps the Fermilab CMS department leadership and the mentoring committee chair informed about their progress.

4.2 Postdoc Meetings

Approximately every 8-12 months the RA reports briefly on their research strategy to the CMS department in an informal monthly meeting (a.k.a. "pizza meeting"). The report is focused on their accomplishments and plans leading them towards research success and their next job, not on details of the research. The RA discusses their accomplishments in the areas of detector/operations, physics results, conference presentations, seminars, publications and management positions. The RA receives support and guidance from senior scientists, as well as news about scientific jobs and conferences that they are encouraged to attend. The meeting serves both a mentoring function and a social team-building function. Scientists learn about RAs they might otherwise not know well, and RAs learn about each other.

The supervisor and the mentor assist the RA in the preparation of the talk, attend the meeting, and do their best to attend other meetings when their RA is not presenting. The mentoring committee members are also strongly encouraged to attend these meetings.

4.3 Meetings between RA, Supervisor, Mentor and Guides

The supervisor, mentor and guides should meet frequently with the RA to discuss progress and issues. They may meet collectively or individually with the RA, but they have the responsibility of keeping each other informed. The annual performance review discussion, described in the next section, is a particularly important meeting which includes the RA, the supervisor, the mentor and the CMS department management.

4.4 RA Performance Reviews

The official performance review process starts with goal setting, usually done in October, or a few months after the postdoc starts his or her term at Fermilab, followed by a review of the goals in May/June, a self-evaluation in July, and the final yearly performance review in September/October. An additional review of the goals, to be done by the RA with the mentor, supervisor and eventual guide, in January/February is suggested but not mandated. The FermiWorks software is used for goal setting and for the performance review, and formally any change of goals and the final performance review need to be approved by the head of the postdoc group and of the CMS department. The supervisor, the mentor and the eventual guide review and approve the goals, which should be consistent with the research plan and which should satisfy the requirements for goal settings, before the RA enters them into FermiWorks. They also provide the initial assessment of the postdoc performance prior to the official review. The head of the CMS department, the head of the RA group, the supervisor, the mentor and the RA all participate in the final yearly performance review.

During the review mentoring discussions should take place emphasizing the importance of the RA engaging in career advancing activities, e.g. giving presentations at collaboration meetings, conferences, and HEP seminars, producing physics and technical publications, and holding convenership positions. After the formal review of past performance, the future plans of the RA are also discussed. In a written future plans section of the performance review the RAs research strategy towards a permanent position is described (when appropriate based on the RAs seniority). This facilitates a discussion on the strategy, including when and where to apply for a job.

4.5 Reports to the RA Mentoring Committee

The supervisor and mentor of each RA will jointly report once a year to the RA mentoring committee by making a presentation during a regular mentoring committee meeting. The report contains details of progress in RAs research,

including leadership roles in analysis or within the CMS management structure, high profile internal talks presented by the RA, conferences attended, seminars given, awards received, publications, and other important achievements. The report also contains a plan for the coming year, including potential relocation and job application strategy.

Following the report, the mentoring committee advises the CMS department management about the RA's progress and may suggest modifications to the research plan. The mentoring committee may also advise on job application strategy, appointment extensions and RA stays at CERN. For extensions and CERN stays, supervisors and mentors jointly submit an email request to the CMS department management describing in a couple of paragraphs the plan for the extension and the reason for the location (Fermilab or CERN).

4.6 Conference Presentations, Seminar and Job Talks

The supervisor and mentor advise their RA about conference talks for which they should be nominated and make sure there is a good pool of senior people supporting the nomination. They also help in arranging seminar presentations to increase visibility and sharpen presentation skill of the RAs, which is particularly important at later stages of their postdoctoral term. Supervisors and mentors organize practice talks for their RAs who are about to give conference presentations or seminars (and especially for all job talks) and schedule them at least a week prior to the actual event. Practice talks are attended by management, scientists and sometimes other RAs, and there is plenty of time allocated at the end for comments on how to improve the presentation.

4.7 Awards and Leadership Nominations

Supervisors and mentors are made aware of awards within CMS, Fermilab, or the general HEP community and are requested to nominate their RAs for these awards. Supervisors and mentors may choose to send drafts of award nominations to the mentoring committee chair for feedback from the committee, if desired.

The supervisor and the mentor will also advise their RA on opportunities to take leadership positions within CMS, and arrange for nominations and support.

4.8 Job Applications

RAs are reminded by management and/or the mentoring committee when academic job season is starting, and given guidance on the right time in their career to apply for a job. Supervisors and the mentors assist their RAs in preparation of the "job application package". Together with the supervisor and mentor, the CV, list of references, research statement, and job talk is reviewed by the management and/or the RA mentoring committee and the RA is advised. Supervisors and mentors work together to arrange for practice talks for job interviews at least a week before the event and inform the department management and mentoring committee chair in

advance. Job talks are practiced in front of the supervisor and interested scientists including members of management and the mentoring committee.

5 RA's Next Position

For most of the RAs, the goal job is a tenure track appointment at a university or a national laboratory. The mentorship program outlined in this document is designed to help them maximize their chances for securing such job. However, our ultimate goal is for the RAs to have a successful career, no matter which path they decide to pursue. As they approach the later stage of their postdoctoral term, some may be interested in exploring non-tenure-track positions, perhaps more technically oriented jobs in HEP, other sciences, and/or industry. In such cases the supervisor and the mentor (within their means and with help from CMS department leadership and mentoring committee) will support the RA by helping to develop the necessary technical skills, help enhance his/her visibility by participating in technical workshops and conferences, and by assisting in establishing contacts with former colleagues who made the transition.